

**UNITED STATES DISTRICT COURT  
DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

Civil Action No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**REDACTED VERSION**

**STATEMENT OF MATERIAL FACTS IN DISPUTE RE: DEFENDANT'S  
MOTION FOR SUMMARY JUDGMENT OF NON-INFRINGEMENT**

Plaintiff, Singular Computing LLC (“Singular”), submits: (A) the following response to the statement of material facts submitted by defendant, Google LLC (“Google”), in support of its motion for summary judgment of non-infringement, and (B) Singular’s statement of material facts in dispute in opposition to the motion:<sup>1</sup>

<b>Statement of Fact</b>	<b>Response</b>
1.	Not disputed.
2.	Disputed to the extent the statement is intended to mean that Dr. Khatri contends that <u>only</u> two versions of the TPU boards infringe the Asserted Claims. Otherwise, not disputed.
3.	Disputed. It is unclear what the term “application-specific integrated circuit board” refers to (as opposed to an ASIC).
4.	Not disputed.
5.	Not disputed.
6.	Not disputed.
7.	Disputed. The blocks shown within the TensorCore do not represent multiple “hardware components.” The TensorCore resides on a single ASIC. <i>See</i> Google SMF Nos. 5, 6.
8.	Not disputed.

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<sup>1</sup> Singular objects generally to the form and format of Google’s Statement of Facts. Rather than presenting the alleged undisputed facts on a fact-by-fact basis, Google’s statement presents such alleged undisputed facts in a colloquial, brief-like form punctuated with myriad footnotes.

Statement of Fact	Response
9.	Disputed. The adjective “large” is a subjective term of extent that is not well defined. Matrix multiplication is performed on “matrices”, not “values.” <i>See</i> Khatri Rpt. ¶ 50. This statement also appears to conflate “signals” and “values,” which the Court rejected in its <i>Markman</i> Order. <i>See</i> Dkt. 354.
10.	Disputed. [REDACTED] <i>See</i> Khatri Rpt. ¶ 129.
11.	Disputed. It is not clear what is meant by [REDACTED] Singular does not dispute that Dr. Khatri’s report sometimes uses the term [REDACTED]
12.	The location of the [REDACTED] is not material to any issue raised in Google’s brief. Singular does not dispute that the quotations are accurate.
13.	Disputed. It is unclear what is meant by “structurally similar” but Singular does not dispute that the TPUv3 “includes many of the same components as the TPUv2 arranged in fundamentally the same way” to infringe the asserted claims. Khatri Rpt. ¶ 83.
14.	Not disputed.
15.	Not disputed.
16.	Not disputed.
17.	Not disputed.
18.	Not disputed.
19.	Disputed. The limitations of earlier claims are not “incorporated” here. Singular does not dispute that this is an accurate representation of claims 53, 43, and 36 of the ’273 patent.
20.	Disputed. The limitations of earlier claims are not “incorporated” here. Singular does not dispute that this is an accurate representation of claims 7, 3, and 2, and 1 of the ’156 patent.
21.	Disputed. This statement is ambiguous as to which claimed “device” it is referring to. Singular does not dispute that Dr. Khatri opines that the accused TPUv2 and TPUv3 infringe the asserted claims as stated in his Report.
22.	What a claim “requires” is a question of law and not a statement of fact. Singular does not dispute the Asserted Claims recite “at least one ... low-precision high dynamic range (LPHDR) execution unit.”
23.	What a claim “requires” is a question of law and not a statement of fact. Singular does not dispute that the Asserted Claims recite an “exceeds” limitation as stated therein.
24.	Disputed. It is not clear what Google mean by this statement. Dr. Khatri’s Report speaks for itself. Dr. Khatri explains that this figure represents the combination of a drawing provided by Mr. Phelps during his deposition and an internal Google document. <i>See</i> Khatri Rpt. ¶ 141.
25.	Disputed. This directly contradicts the cited passage of Dr. Khatri’s report.
26.	This appears to be identical to #23. What a claim “requires” is a question of law and not a statement of fact. Singular does not dispute that the Asserted Claims recite an “exceeds” limitation as stated therein.

<b>Statement of Fact</b>	<b>Response</b>
27.	Dr. Khatri's report speaks for itself. To the extent this statement is intended to mischaracterize Dr. Khatri's report, it is disputed.
28.	Dr. Khatri's report speaks for itself. To the extent this statement is intended to mischaracterize Dr. Khatri's report, it is disputed.
29.	What "must be" in the accused devices is a question of law and not a statement of fact. Singular does not deny that the number [REDACTED] exceeds the number [REDACTED] by at least one hundred or that the number of LPHDR execution units in the device exceeds [REDACTED].
30.	Disputed. It is not clear what is meant by "only." Singular does not dispute that there are [REDACTED] on each TPUv2 board.
31.	Disputed. It is not clear what is meant by "only." Singular does not dispute that there are [REDACTED] on each TPUv3 board.
32.	Disputed. Dr. Khatri's report speaks for itself. This statement omits relevant opinions and evidence from Dr. Khatri's report. For example, Dr. Khatri's Report clearly states that there are [REDACTED] LPHDR execution units per MXU. <i>See, e.g., Khatri Report, ¶¶ 0225-0227.</i>
33.	Disputed. Dr. Khatri's report speaks for itself. This statement omits relevant opinions and evidence from Dr. Khatri's report. For ex example, Dr. Khatri's Report clearly states that there are [REDACTED] LPHDR execution units per TPUv3. <i>See, e.g., Khatri Report, ¶ 0227.</i>
34.	Google has truncated footnote 2. Singular does not dispute that footnote 2 includes the quoted portion. To the extent the unquoted part of this statement is intended to be inconsistent with paragraph 62 it is disputed.
35.	Disputed. This statement is not supported by the cited passages from the Khatri Report. Moreover, it is unclear what Google intends to mean by "proper," "in lieu of" and "physical structures." <i>See also Khatri Rpt. ¶¶ 125-146, 222-238.</i> Singular does not dispute that paragraph 233 includes the quoted portion.

Set forth below is Singular's identification of material facts in dispute ("SMF"):

<b>No.</b>	<b>Statement of Fact</b>	<b>Supporting Evidence</b>
SMF 1.	The Asserted Claims recite an LPHDR execution unit adapted to execute a first operation.	'156 Patent, cl. 7; '273 Patent, cl. 53.
SMF 2.	Each MXU component in the Accused Devices corresponds to [REDACTED] LPHDR physical execution units.	<i>See Khatri Rpt., ¶¶ 224-227</i>
SMF 3.	The TPUv2 contains [REDACTED] MXUs and thus includes a total of [REDACTED] LPHDR execution units.	<i>See Khatri Rpt., ¶¶ 224-227</i>
SMF 4.	The TPUv3 contains [REDACTED] MXUs and thus includes a total of [REDACTED] LPHDR execution units.	<i>See Khatri Rpt., ¶¶ 224-227</i>

No.	Statement of Fact	Supporting Evidence
SMF 5.	Each LPHDR execution unit includes [REDACTED] [REDACTED] [REDACTED]	See Khatri Rpt., ¶¶ 128-145
SMF 6.	[REDACTED] [REDACTED] [REDACTED]	See Khatri Rpt., ¶¶ 231-232
SMF 7.	[REDACTED] [REDACTED]	See Khatri Rpt., ¶¶ 228-232
SMF 8.	The [REDACTED] LPHDR execution unit.	'156 Patent, 13:42-60; Leeser Tr. at 150:16-22; <i>see id.</i> at 151:22-152:7; Gustafson Rpt. ¶ 256
SMF 9.	Each LPHDR execution unit can only [REDACTED] [REDACTED] [REDACTED]	Khatri Rpt., ¶ 140
SMF 10.	On July 27, 2022, the Court issued a Memorandum and Order on Claim Construction ("CCO") in this case.	Dkt. No. 354
SMF 11.	In the CCO, the Court construed "execution unit" as being a "processing element comprising an arithmetic circuit paired with a memory circuit."	Dkt. No. 354 at P. 8-9
SMF 12.	The CCO does not suggest or require that the same circuitry cannot be shared by more than one LPHDR execution unit.	Dkt. No. 354
SMF 13.	The number of "execution units in the device adapted to execute at least the operation of multiplication on floating point numbers that are at least 32 bits wide" in each accused TPUv2 and TPUv3 board is [REDACTED]	See Khatri Rpt. ¶¶ 234-235
SMF 14.	[REDACTED] [REDACTED] [REDACTED]	See Khatri Rpt., ¶¶ 228-232
SMF 15.	Each TPUv2 incorporates each and every element of claim 7 of the '156 patent.	See Khatri Report, ¶¶ 059-0238.
SMF 16.	Each TPUv3 incorporates each and every element of claim 7 of the '156 patent.	See Khatri Report, ¶¶ 059-0238.
SMF 17.	Each TPUv2 incorporates each and every element of claim 53 of the '273 patent.	See Khatri Report, ¶¶ 059-0245.
SMF 18.	Each TPUv3 incorporates each and every element of claim 53 of the '273 patent.	See Khatri Report, ¶¶ 059-0245.

Dated: May 19, 2023

Respectfully submitted,

/s/ Kevin Gannon

Matthew D. Vella (BBO #660171)

Adam R. Doherty (BBO #669499)

Kevin Gannon (BBO #640931)

Brian Seeve (BBO#670455)

Daniel McGonagle (BBO #690084)

**PRINCE LOBEL TYE LLP**

One International Place, Suite 3700

Boston, MA 02110

Tel: (617) 456-8000

Email: mvella@princelobel.com

Email: adoherthy@princelobel.com

Email: kgannon@princelobel.com

Email: bseeve@princelobel.com

Email: dmgonagle@princelobel.com

ATTORNEYS FOR THE PLAINTIFF

**CERTIFICATE OF SERVICE**

I certify that all counsel of record who have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system.

/s/ Kevin Gannon